



Mathematical modelling of the impact of climatic conditions in France on *Rhipicephalus sanguineus* tick activity and density since 1960

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Abstract:

Rhipicephalus sanguineus, the brown dog tick, has a worldwide distribution in areas with a relatively warm climate, including mild winters. This tick plays an important role as vector for various animal and human pathogens, including bacteria and protozoa. Based on precise daily meteorological data from the past 40 years, combined with mathematical modelling designed to predict tick activity, two modelling approaches were developed. The first examined the evolution of the number of weeks with favourable biological conditions for ticks in four French cities located at various latitudes of the country: Nimes in the south, Paris in the north, Lyon in the east and Nantes in the west. The second analysed the extension of the geographical surface area in km² where the biological conditions favour tick activity for at least 12 weeks per year. Both analyses revealed clear evidence of increased temperatures coupled with an augmented tick activity index in three of the four cities. However, the change was not significant in Nimes, where the climate is Mediterranean and the tick is already endemic. For Paris, Lyon and Nantes, the activity index values have increased significantly, i.e. by 4.4%, 4.0% and 3.4%, respectively. The distribution of the activity index values is evolving strongly with significantly fewer values below 50% since the 1960s and a clear decrease of values between 20% and 50% during the latest decade. Between 1960 and 2000, the theoretical extension of the surface area where the climatic index is suitable for *R. sanguineus* has increased by 66%. Even though several other important factors, such as changes in biotopes or human activity, are not included in this study, the resulting patterns and trends are noticeable. Our models constitute the first demonstration of the impact of climate change on the activity and distribution of ticks and confirm the observed northward migration trend for this Mediterranean domestic tick.

Source: <http://geospatialhealth.net/index.php/gh/article/view/178>

Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Meteorological Factors, Temperature

Temperature: Fluctuations

Geographic Feature:

resource focuses on specific type of geography

Climate Change and Human Health Literature Portal

None or Unspecified

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Europe

European Region/Country: European Country

Other European Country : France

Health Impact:

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Tick-borne Disease

Tick-borne Disease: General Tick-borne Disease

Model/Methodology:

type of model used or methodology development is a focus of resource

Methodology

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Time Scale Unspecified